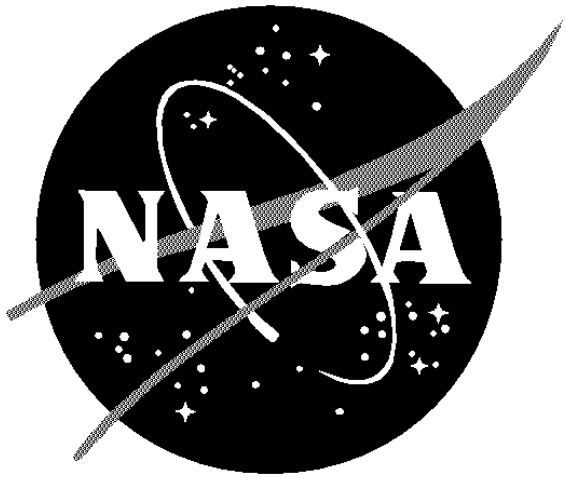

National Aeronautics and Space Administration

February 3, 2004

NRA-04-OES-02

RESEARCH ANNOUNCEMENT

OCEANS and ICE

Notice of Intent Due March 4, 2004
Proposals Due May 4, 2004

OMB Approval No. 2700-0087

OCEANS AND ICE

NASA Research Announcement
Soliciting Research Proposals
for
Period Ending
May 4, 2004

NRA 04-OES-02
Issued February 3, 2004

Office of Earth Science
National Aeronautics and Space Administration
Washington, DC 20546

NASA RESEARCH ANNOUNCEMENT

OCEANS and ICE

1.0 Purpose of this NASA Research Announcement

This NASA Research Announcement (NRA) solicits oceans and ice research that contributes to a unified approach to study variations in the Earth's climate system. This NRA specifically seeks proposals for scientific investigations and research activities contributing to the continuation and enhancement of NASA's Physical and Biological Oceanography Programs and Cryospheric Sciences Program. It also seeks proposals that utilize this knowledge in facilitating the development and evaluation of models and data assimilation systems that include representations of the oceanic and cryospheric aspects of the Earth's climate system. In particular this announcement seeks innovative investigations that utilize NASA's observational data for investigations of ocean, ice and climate processes. This announcement is for the selection of investigations to be carried out for a period of up to 3 years.

2.0 Introduction

The NASA vision is:
To improve life here
To extend life to there
To find life beyond

The NASA mission is:
To understand and protect our home planet
To explore the Universe and search for life
To inspire the next generation of explorers
...as only NASA can

The Earth Science Enterprise is one of six NASA enterprises seeking to fulfill the agency's vision and carry out its mission (http://www.earth.nasa.gov/visions/index.html). The ESE mission is to understand and protect our home planet by using our view from space to study the Earth system and improve predictions of Earth system change. The ESE, working with its domestic and international partners, provides accurate, objective scientific data and analyses to advance our understanding of Earth system processes and to help policy makers and citizens achieve economic growth and effective, responsible stewardship of Earth's resources. The ESE research program aims to acquire deeper scientific understanding of the components of the Earth system, their interactions, and the consequences of changes in the Earth system for life. These interactions occur on a

continuum of spatial and temporal scales ranging from short-term weather to long-term climate and motions of the solid Earth, and from local and regional to global.

The frontier of Earth system science is to: (1) explore interactions among the major components of the Earth system – continents, oceans, atmosphere, ice, and life, (2) distinguish natural from human-induced causes of change, and (3) understand and predict the consequences of change. NASA has established six scientific focus areas for these complex processes. These scientific focus areas are: Atmospheric Composition, Carbon Cycle and Ecosystems, Climate Variability and Change, Earth Surface and Interior, Water and Energy Cycle, and Weather. Roadmaps have been developed to summarize the technology, observations, modeling, field campaigns, basic research, and partnerships needed over time to achieve the long-term goals for each of these focus areas (http://earth.nasa.gov/roadmaps/). The roadmap for both the Climate Variability and Change, and the Carbon Cycle and Ecosystems focus areas provides the strategic framework for research under this NRA. ESE focus areas are interrelated and must eventually be integrated to arrive at a fully interactive and realistic Earth system representation. The opportunities for research offered in this NRA fall within the Climate Variability and Change, and the Carbon Cycle and Ecosystems Focus Areas, but there are strong interrelationships with other focus areas that must not be overlooked in research plans.

Five fundamental questions drive ESE research:

- How is the global Earth system changing?
- What are the primary causes of change in the Earth system?
- How does the Earth system respond to natural and human-induced changes?
- What are the consequences of change in the Earth system for human civilization?
- How will the Earth system change in the future?

These core questions represent a paradigm of forcing, response, and the processes that link these and maintain feedbacks within the Earth system. The topics called out by this NRA will help ESE to answer, either in full or in part, the following subset of the Enterprise's 24 second-tier research questions related to the Climate Variability and Change, and Carbon Cycle and Ecosystems Focus Areas. The questions listed below are concerned with both the natural and anthropogenic changes in the ocean and cryosphere, and their interactions with the Earth's climate on seasonal and longer time scales. These questions are:

1) How is the global ocean circulation varying on interannual, decadal and longer time scales?
2) How are the global ecosystems changing?
3) What changes are occurring in the mass of the Earth's ice cover?
4) How can climate variations induce changes in the global ocean circulation?
5) How is global sea level affected by natural variability and human-induced change in the Earth system?

6) How do ecosystems and biogeochemical cycles respond to and affect global environmental change?
7) What are the consequences of climate change and increased human activities for coastal regions?

To this end, the ESE Strategy (http://www.earth.nasa.gov/visions/ESE_Strategy2003.pdf) calls for (a) global observations of the ocean, in terms of color, altimetry, surface winds, surface temperature and sea ice cover, and (b) ice sheet, ice cap and glacier observations in order to determine their mass balance and contributions to sea level change. NASA's ESE Research Programs place emphasis on the productive interaction between activities related to observations, modeling and field campaigns. The NASA Oceanography Program also participates in the annual National Oceanographic Partnership Program (NOPP) Broad Agency Announcement (BAA). NASA has focused most of its support for the Global Ocean Data Assimilation Experiment (GODAE) through the NOPP and expects to continue this approach for accommodating proposals focused on GODAE through NOPP.

Syntheses between models and data analyses are also encouraged at all levels to better utilize the remote sensing measurements and expand their application to significant Earth Science questions that face us today.

3.2 Program Descriptions

The primary scientific thrust for Physical Oceanography at NASA is to characterize the physical state of the ocean on a global scale, and to improve our capability to understand the role of oceans in Earth's climate and its variability. Since the general ocean circulation plays a key role in the air-sea heat budget on scales consistent with global climate change, basic understanding and modeling of the state of the coupled ocean-atmosphere system is fundamental to comprehensive climate studies. NASA employs the unique vantage point of space-based observations to enable the rapid collection of global data sets such as sea-surface temperature (SST; EOS-Terra, Aqua; Tropical Rainfall Mapping Mission Microwave Radiometer), sea-surface topography (TOPEX/Poseidon and Jason), and sea-surface vector winds (QuikSCAT and SeaWinds). Through such measurement activities NASA contributes to the World Climate Research Program's Climate Variability and Predictability Program (CLIVAR). All of these activities are part of the Climate Variability Focus Area being pursued by NASA's ESE.

NASA's Ocean Biology and Biogeochemistry program focuses on describing, understanding, and predicting the biological and biogeochemical regimes of the upper ocean as determined from space and other suborbital platforms. Various physical and biological oceanographic mechanisms (e.g., phytoplankton blooms, presence of a specific

species or functional group) cause much of the spatial and temporal variability of phytoplankton in the ocean. Thus, by determining the nature of the space/time variability of ocean color e.g. phytoplankton and physical functional groups, significant progress will be made towards understanding the ocean's role in the global biogeochemical cycling. The Moderate Resolution Imaging Sectroradiometer (MODIS; on EOS Terra and Aqua satellites) can view the phytoplankton content of the ocean on a wide range of time and space scales. In addition, the Sea Viewing Wide Field-of-View Sensor (SeaWiFS) together with the older Coastal Zone Color Scanner have provided historical satellite data that complement the newer MODIS data. We also seek to develop and improve ecological models to advance our understanding of the role of the ocean (and climate feedbacks) in the changing Earth system. The biological oceanographic research program at NASA ESE is an important component of the Carbon Cycle and Ecosystems Focus Area. These data are available through the Goddard Space Flight Center Distributed Active Archive Center (DAAC).

No complete understanding of the biological variability in the ocean will be forthcoming without complementary knowledge of the physical processes acting upon it. Thus, images of ocean color may portray biological variability driven largely by physical processes, such as surface winds and ocean circulation. It is important for proposed projects to incorporate the analysis of a variety of satellite and in situ data to solve problems in biological processes and their variability. In some areas it will be difficult to utilize satellite measurements (i.e. some coastal zones) alone to clearly define biological conditions, and investigators are encouraged to merge satellite and in situ data to best resolve oceanographic conditions in these areas. In many cases there will be novel approaches to combining these various measurements into new products that better define the conditions of interest. The satellite observations of physical properties of oceans are available through the Jet Propulsion Laboratory DAAC.

An emerging area of increased emphasis in NASA's Physical and Biological Oceanography Programs is research on the coastal oceans, where applications of NASA satellite measurements are very limited. Proposals are solicited that focus on extending NASA's satellite measurements and modeling efforts into the coastal domain to support growing regional studies. These studies will be vitally important for observing, understanding and predicting ecosystem variability and change in coastal regions.

NASA's Cryospheric Sciences program focuses on understanding changes in the Earth's ice cover on both land and sea, and determining the effects of these changes on the Earth system. Model simulations and recent observations suggest that the ice-covered regions of the Earth are the most sensitive to climate change. Arctic ice cover has been diminishing in the later part of the 20^{th} century, in particular the perennial sea ice cover. On land, the near-coastal areas of the Greenland ice sheet have experienced dramatic thinning in recent years, as have portions of Canadian and Alaskan ice caps and glaciers. Various parts of Antarctica and its surrounding seas have shown a considerable reduction in ice mass as well, but growth in others. In view of the wide range of spatial variability, we seek to understand the mechanisms that control these changes and the associated implications for the Earth system. Ultimately, we seek to develop models that can be

used to reliably forecast future ice conditions and their effects on the Earth system. As with the physical oceanography elements of this NRA the Cryospheric elements are part of the Climate Variability and Water and Energy Cycle Focus Areas in NASA's ESE.

In the case of sea ice, it is important to understand the role of these changes in extent, concentration, thickness and dynamics in the circulation of the ocean and the global climate. This understanding will make it possible to examine the feedback mechanisms associated with sea ice cover, and should lead to improved climate predictions as well as a quantitative assessment of the links between high-latitude and low-latitude climates. Among the data sets available to support such efforts are those stored at the Distributed Active Archive Center (DAAC) at the National Snow and Ice Data Center (http://nsidc.org/data) and those from the RADARSAT Geophysical Processor System (http://www-radar.jpl.nasa.gov/rgps/radarsat.html).

On land, understanding the mass balance of the Earth's ice sheets and glaciers is essential to understanding their contributions to sea level. Since 1995, NASA's Program for Arctic Regional Climate Assessment (PARCA) has focused a coordinated effort on determining the mass balance of the Greenland ice sheet through a combination of targeted field campaigns, satellite data analysis, aircraft observations and process modeling. PARCA has provided the first overall observational assessment of the ice sheet mass balance, showing significant changes near coastal regions. Currently, PARCA efforts are aimed at understanding the mechanism that drives these observed changes while continuing to monitor them, paying specific attention to the behavior of the dynamic outlet glaciers and their controls over ice sheet mass balance. A variety of PARCA data sets have been developed and are being made available through links at the National Snow and Ice Data Center (NSIDC) at : http://nsidc.org/NASA/PARCA/. Individuals seeking support for PARCA-related activities are encouraged to visit this web site and review the posted PARCA Science and Planning Meeting report. Additional efforts have focused on examining mass balance processes in Antarctica, Patagonia, the Canadian ice caps and Alaskan glaciers. Some of these efforts are highlighted by recent aircraft campaigns (information available at http://aol.wff.nasa.gov/aoltm.html) and the RADARSAT Antarctic Mapping Missions (http://www-bprc.mps.ohio-state.edu/rsl/radarsat/radarsat.html). The most recent Antarctic campaign was carried out jointly with the Centro Estudios Cientificos (CECS) located in Valdivia, Chile and the Chilean Navy, during which elevation and ice penetrating radar surveys were made on the Antarctic Peninsula and the Amundsen Sea Embayment.

3.3 Research Topics for Requested Proposals

This NASA Research Announcement (NRA) solicits proposals that address the following topics. Proposals may include elements associated with more than one topic, but must clearly delineate the work allocated to each topic. The topics in physical oceanography and cryospheric science both relate to NASA ESE's Climate Variability and Water and Energy Cycle Focus Areas while the biological oceanography elements are part of the Carbon Cycle and Ecosystems Focus Area. Each topic is described in greater detail in the following sections:

1) Multi-sensor studies of ocean phenomena

Various satellite sensors provide complementary measurements that can be combined to get a better understanding of many ocean phenomena. A good example is coastal upwelling which causes cool surface temperatures near the coast that are reflected in infrared and passive microwave sea surface temperatures (SSTs), and increased biological production in nutrient rich waters which is reflected in the chlorophyll content estimated from ocean color imagery. We now have routine measurements of sea surface height from altimetry, SST from infrared and passive microwave instruments, ocean color from optical sensors and ocean surface vector winds from radar backscatter. Studies that combine and synthesize measurements to better understand ocean processes are the subjects of this part of the solicitation.

2) Understanding and estimation of air-sea fluxes

The ability to make global estimates of air-sea fluxes of heat, freshwater, momentum and gases is fundamental to our capability to predict long-term climate variations. Development of methodologies to utilize remotely sensed properties of the sea surface and the atmospheric boundary layer to determine fluxes are sought.

3) Understanding decadal changes in ocean, ice and related climate conditions

This announcement seeks proposals that will lead to an increased understanding of decadal variability as seen in a combination of satellite and in situ data sets including theoretical and modeling developments that help to resolve decadal and longer-term changes in climate and coupled ocean-atmosphere modes of variability.

4) Providing the scientific basis for next generation ocean and ice remote sensing technologies

Priority areas presently supported include GPS reflection phenomenology, surface salinity remote sensing and sea ice thickness measurements (including snow cover), optical sounding of the ocean with lasers and hyper spectral remote sensing. Program support is limited to theoretical and background studies focused on the geophysical signals addressed by the corresponding remote sensing technology innovations mentioned above. Proposals are also sought to conceptualize future space-based observing systems and their attributes such as measurement accuracy, and spatial/temporal sampling characteristics. Instrument development and implementation is the subject of separate program announcements from NASA Headquarters (http://esto.nasa.gov/index.html).

5) Dynamics in coastal zones

The coastal ocean serves as the interface between land-based ecosystems and the open ocean. The importance of the coastal ocean in terms of its physical behavior,

biogeochemical cycling, and ecological dynamics is strongly linked to its proximity to world population centers. An increasing proportion of the global population lives within the coastal zones of all major continents, increasing agricultural, industrial, and other human-related effects on coastal ocean biology and biogeochemistry. Satellite observations of the coastal ocean can provide important information on coastal ocean processes, including identifying event-scale phenomena (e.g., algal blooms), fronts, and riverine plumes, and assist in studies of biogeochemical cycling and ecological dynamics. A key goal is to understand the relationship of the coastal regions to the adjacent land and the global oceans. Proposals are sought to advance our understanding of coastal ocean biology and associated biological processes that may affect ocean biogeochemistry. Furthermore, the coastal ocean needs to be embedded in larger-scale ocean models and in models that describe land-ocean interactions to provide necessary boundary conditions.

6) Temporal and spatial variability of primary productivity and new production in the coastal and open ocean

A key to understanding the "biological pump" in the ocean is to learn about the variability of primary productivity. Seasonal or periodic phytoplankton blooms cause most of the variability in production, and thus knowledge of this variability will be needed to improve the accuracy of global ocean productivity estimates. This NRA solicits research to advance quantification and modeling capabilities of primary production and new production. We also encourage proposals that improve measurements or models of key variables to accurately quantify and enable prediction of primary productivity, particularly within the coastal zone.

7) Identification of phytoplankton taxonomic or functional groups from space or airborne sensors

Ecological models, particularly within biologically complex coastal zones, are limited in their capability to describe and predict phytoplankton group dynamics and changes in physiology as a response to local atmospheric and oceanographic forcings (such as storm events), as well as climate change. Following the topic immediately above, a key to understanding ecosystem dynamics in the ocean is to understand what controls phytoplankton blooms (e.g., diatoms). Aside from diatom blooms, other phytoplankton functional groups play specific roles aquatic ecosystem dynamics, such as the production of calcium carbonate from coccolithophorids or the fixation of nitrogen from blue-green algae. Characterizing the distribution of these key phytoplankton groups using novel remote sensing techniques is a central scientific goal.

8) Investigating the role of sea ice in the Earth system

Simulations suggest that the high latitudes (particularly the high northern latitudes) will be most sensitive to climate change. Studies that can shed light on the extent to which climate at high latitudes is effectively and responsively linked to climate

changes at lower latitudes through oceanographic or sea ice mechanisms are important. Such studies will help to determine the amplitude and rapidity of the response of the climate system as a whole to any changes in climate. Key elements of interaction include ice mass redistribution, salt and heat fluxes, thermohaline circulation and atmosphere dynamics, particularly in the marginal ice zone. The key is to be able to devise a strategy that enables the importance of these linkages to be evaluated and examines the energy, mass and momentum exchanges within the ocean-atmosphere system. Ultimately, these investigations should lead to improved model representation of sea ice processes and their climate feedbacks in climate models.

9) Outlet glaciers

Outlet glacier responses to climate change can occur much more rapidly than those of the ice sheet interior. Consequently, models that attempt to predict changes in ice sheet mass balance are limited by their ability to resolve these time-varying responses and characterize the linkages among outlet glaciers, their floating ice shelves/tongues and the rest of the ice sheet. In view of the recent changes in many of Greenland's outlet glaciers and some in Antarctica, this NASA Research Announcement solicits proposals that are specifically targeted toward understanding the controls that outlet glaciers and ice streams exhibit on overall ice sheet mass balance. Investigations should be targeted toward:

a. determining the extent to which dynamics, ablation, and accumulation control the mass balance of some of the more rapidly-changing outlet glaciers
b. quantitatively characterizing the linkages between outlet glaciers and the ice sheets they drain, including the controls exhibited by their floating tongues and ice shelves.
c. assessing the likelihood of rapid ice sheet response to large changes that have been observed in some outlet glaciers

Some limited resources are expected to be available for a coordinated field campaign in the Jakobshavn drainage region of West Greenland in 2005. These are intended to expand the current in situ data sets in support of observation and modeling activities. Other field locations in Greenland will be considered if the associated deployment costs are modest and/or cost-shared by other domestic/international sponsors, but because of the available data, recent dramatic changes, and the need to efficiently focus field activities, the primary site for such investigations is intended to be the Jakobshavn region. We do, however, strongly encourage remote sensing-based studies and associated modeling efforts for any key outlet glaciers and ice streams in Greenland and Antarctica, especially investigations that make use of the data collected during the Arctic Ice Mapping missions in Greenland, the Antarctic campaign carried out jointly with the Chileans in the fall of 2002, and the RADARSAT Antarctic Mapping Project (RAMP) conducted jointly with the Canadian Space Agency.

4.0 Related Opportunities

The ESE has recently released an NRA for Carbon Cycle Science research that provides opportunities for complementary investigations that utilize remote sensing data to understand regional and global carbon cycling within the Earth system (http://research.hq.nasa.gov/code_y/code_y.cfm). NASA's research on ocean biology and biogeochemistry requires close coordination with research in physical oceanography and carbon cycling. Together, the Carbon Cycle Science and Oceans and Ice NRAs call for proposals to address this need. Investigators interested in proposing research on the measurement of ocean color, to analyze oceanic primary productivity, or to study biogeochemical cycles other than that of carbon, without applying their analyses to the resolution of carbon cycle science questions, should propose to this Oceans and Ice NRA. Investigators interested in proposing research to understand the role of the ocean in carbon cycling and focused on achieving the goals of the North American Carbon Program (NACP) or on the study of the integrated carbon cycle, either globally or regionally, should propose to the Carbon Cycle Science NRA.

5.0 Funding

Total funds available for work selected for this NRA in Oceans and Ice are approximately $16M over three years. While there are no specific requirements for proposal budgets, we do not expect budgets to exceed $250,000 per year, and in most cases they are expected to be less.

The allocation of funds across the research themes is expected to be about even, but will be based on the research priorities outlined in the ESE Research Strategy, the quality of the proposals received and considerations of program balance. Proposals outside these themes but linked to the general topic areas may be considered, but must be highly meritorious and competitive to be considered.

Awards will be made for a period of up to three years to proposals that are approved under the terms of this announcement. Annual renewals of projects funded under this NRA are contingent upon annual performance report and the availability of funds. NASA reserves the right to cancel this NRA if adequate funds are not appropriated.

6.0 Guidance for Proposers

This NRA solicits proposals for scientific investigations that are consistent with the objectives as detailed above, and that meet other requirements that are listed in the appendices. The proposal should provide sufficient detail to enable a reviewer to assess the value of the proposed research, and the probability that the investigators will be able to accomplish the stated objectives within the requested resources and schedule. General guidelines for all responses to this and other NRAs are given in Appendix A.

Participation in this research opportunity is open to all categories of domestic and foreign organizations including educational institutions, industry, non-profit institutions, NASA

research centers, and other government agencies and laboratories (including Federally Funded Research and Development Centers). However, the international proposals are based on no exchange of funds, but will receive full data and information support from NASA research satellites and sponsored field experiments.

Programmatic priority will be given to those proposals making the strongest links to the Earth Science Enterprise objectives through the analysis of remote-sensing data and by addressing oceanographic problems at basin or global scales. Priority ice sheet investigations are those that seek to assess and understand ice sheet mass balance characteristics on scales that significantly affect sea level.

7.0 Additional Information

Appendix A provides general guidelines for responding to NASA Research Announcements. Appendix B, C and D contain information about the required proposal cover page, a sample proposal cover sheet (with required institutional declarations) and instructions for submitting the notice of intent to propose electronically. Appendix E contains the budget summary form. If electronic access is not available to prospective proposers, a hard copy can be requested by calling (202) 358-3552 and leaving a voice mail message. Please leave your full name and address, including zip code, and your telephone number, including area code. *Prospective investigators are urged to read the information in all of the appendices carefully and to follow completely the specific guidelines therein. In addition guidance is available on the Proposal Opportunities website (http://research.hq.nasa.gov/code_y/code_y) and the online Guidebook for Proposers at (http://www.hq.nasa.gov/office/procurement/nraguidebook/).*

The following items apply only to this announcement.

Identifier: NRA-04-OES-02

Submit Proposals to: Oceans and Ice NRA
NASA Peer Review Services, Code Y
500 E Street, SW
Suite 200
Washington, DC 20024-2760

For overnight mail delivery purposes only, the recipient telephone number is (202) 479-9030.

Number of Copies Required: 20

NASA Selecting Official: Director, Research Division
Office of Earth Science

Finally, prospective proposers are advised that safety is a top priority for all of NASA's programs. Safety is the freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment. NASA's safety priority is to protect: (1) the public, (2) astronauts and pilots, (3) the NASA work force (including employees working under NASA award instruments), and (4) high-value equipment and property.

Your interest and cooperation in participating in this opportunity are appreciated.

Ghassem R. Asrar
Associate Administrator for
Earth Science

Enclosures:
Appendix A - Instructions for Responding to NASA Research Announcements
Appendix B - Required Proposal Cover Page
Appendix C - Notice of Intent to Propose
Appendix D – Sample Proposal Cover Page with Institutional Declarations
Appendix F – Budget Summary Sheet and Instructions

Additional Information:

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Appendix A

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS (1852.235-72, OCTOBER 2002)

(a) **General.**

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRAs contain programmatic information and certain requirements that apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information that applies to responses to all NRAs.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. The NASA contracting officer will determine the appropriate award instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(b) **NRA-Specific Items.** Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.

(c) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) **Transmittal Letter or Prefatory Material.**

(i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;

(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;

(iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;

(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;

(v) Identification of other organizations that are currently evaluating a proposal for the same efforts;

(vi) Identification of the NRA, by number and title, to which the proposal is responding;

(vii) Dollar amount requested, desired starting date, and duration of project;

(viii) Date of submission; and

(ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

(2) **Restriction on Use and Disclosure of Proposal Information.** Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

Notice

Restriction on Use and Disclosure of Proposal Information

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) **Abstract.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) **Project Description.**

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) **Management Approach.** For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.

(6) **Personnel.** The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items, which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) **Facilities and Equipment.**

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

(8) **Proposed Costs (U.S. Proposals Only).**

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for

salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations). All proposals involving NASA employees as either PI or as a CO-I must be shown in full cost in accordance with Agency full cost accounting standards (www.hq.nasa.gov/fullcost).

(iv) Use of NASA funds--NASA funding may not be used for foreign research efforts at any level, whether as a collaborator or a subcontract (also see paragraph l). The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted. Additionally, in accordance with the National Space Transportation Policy, use of a non-U.S. manufactured launch vehicle is permitted only on a no-exchange-of-funds basis.

(9) **Security.** Proposals should not contain security-classified material. If the research requires access to or may generate security-classified information, the submitter will be required to comply with Government security regulations.

(10) **Current Support.** For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) **Special Matters.**

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines. Of particular interest are proposed use of radioactive or hazardous materials or lasers.

(ii) Identify and discuss risk factors and issues throughout the proposal where they are relevant, and your approach to managing these risks.

(iii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d) **Renewal Proposals.**

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(e) **Length and Page Format.** Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. **Proposals are not to exceed 20 pages**, including references and figures (cover pages, certifications, budget sheets, and attachments are not included in this page limit). Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments. The font size should be no smaller than 12 point.

(f) **Joint Proposals.**

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment, which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals, which specify the internal arrangements NASA will actually make, are not acceptable as a means of establishing an agency commitment.

(g) **Proposal Deadlines.** Proposals or proposal modifications received after the latest date specified for receipt may be considered if a significant reduction in cost to the Government is probable or if there are significant technical advantages, as compared with proposals previously received. This solicitation will remain open for 90 days after its release.

(h) **Withdrawal.** Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances, which dictate termination of evaluation.

(i) **Evaluation Factors.**

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these, which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds. Cost is of substantially less weight than the other factors combined.

(j) **Evaluation Techniques.** Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal, which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(k) **Selection for Award.**

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(l) **Additional Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.**

(1) NASA welcomes proposals from outside the U.S. However, foreign entities are generally not eligible for funding from NASA. Therefore, unless otherwise noted in the NRA, proposals from foreign entities should not include a cost plan unless the proposal

involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the foreign entity is proposing. Such endorsement should indicate that the proposal merits careful consideration by NASA, and if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed.

(2) All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the NRA. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established closing date. Those received after the closing date will be treated in accordance with paragraph (g) of this provision. Sponsoring foreign government agencies or funding institutions may, in exceptional situations, forward a proposal without endorsement if endorsement is not possible before the announced closing date. In such cases, the NASA sponsoring office should be advised when a decision on endorsement can be expected.

(3) Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency or funding institution will each bear the cost of discharging their respective responsibilities.

(4) Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(i) An exchange of letters between NASA and the foreign sponsor**;** or

(ii) A formal Agency-to-Agency Memorandum of Understanding (MOU).

(m) **Export Control Guidelines Applicable to Proposals Including Foreign Participation.**

Proposals including foreign participation must include a section discussing compliance with U.S. export laws and regulations, e.g., 22 CFR Parts 120-130 and 15 CFR Parts 730-774, as applicable to the circumstances surrounding the particular foreign participation. The discussion must describe in detail the proposed foreign participation and is to include, but not limited to, whether or not the foreign participation may require the prospective proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available at http://www.pmdtc.org and http://www.bxa.doc.gov. Proposers are advised that under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130.

(n) **Cancellation of NRA.** NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

(o) **Data Policy**

NASA's policy is to work cooperatively with other U.S. government agencies and our international partners in the development of a comprehensive capability to observe and understand the Earth. In addition, both National and NASA policy require NASA to support private-sector investment in commercial space activities by committing the U.S. government to purchase commercially available goods and services. NASA will not develop a mission that in any significant way competes with or duplicates commercially available goods or services from U.S. industry.

APPENDIX B

Required Proposal Cover Page

Two steps are required to submit a cover page. The first step is to complete the proposal cover page (see SAMPLE Appendix D) **electronically** to the SYS-EYFUS Website located at **http://proposals.hq.nasa.gov/**. If the proposer has submitted an electronic Notice of Intent (Appendix F) to SYS-EYFUS, the same user UserID and password can be used to complete the electronic proposal cover page. If the proposer obtained a User ID and password in the process of submitting a proposal for a previous research opportunity announcement, the same user UserID and password can be used to complete the electronic proposal cover page in response to this research opportunity announcement. Be sure to click on "Edit Personal Information" if any of your correspondence information in SYS-EYFUS is not current.

The second step is to print a **hard copy** (see Appendix D) of the electronic cover page that must be signed by the Principal Investigator and an official of the investigator's organization who is authorized to commit the organization. This authorizing signature also certifies that the proposing institution has read and is in compliance with the required certifications printed in full, therefore, these certifications do not need to be submitted separately. This page will not be counted against the page limit of the proposal.

If you do not have a SYS-EYFUS UserID or password, you may obtain one electronically by going to **http://proposals.hq.nasa.gov** and performing the following steps:

a) Click the hyperlink for **new user** that will take you to the Personal Information Search Page.
b) Enter your first and last name. SYS-EYFUS will **search** for your record information in the SYS-EYFUS database.
c) Confirm your personal information by **choosing** the record displayed or continue for new input.
d) Select **continue**, and a User ID and password will be e-mailed to you.

Once you receive your User ID and Password, **login** to the SYS-EYFUS website and follow the instructions for **New Proposal Cover Page.**

Proposers without access to the web or who experience difficulty in using this site may contact the Help Desk at **proposals@hq.nasa.gov** (or call 202-479-9376) for assistance. After you have submitted your notice of intent or proposal cover page electronically, if you are unsure if it has been successfully submitted, **do not re-submit**. Please call the Help Desk. They will be able to promptly tell you if your submission has been received. Please note that submission of the electronic cover page does not satisfy the deadline for proposal submission.

Appendix C

Notice of Intent to Propose

In order to plan for a timely and efficient peer review process, *Notices of Intent* (NOI's) to propose are strongly encouraged by the date given in this NRA. The submission of a NOI is not a commitment to submit a proposal, nor is information contained therein considered binding on the submitter. NOI's are to be submitted electronically by entering the requested information through SYS-EYFUS Web site located at **http://proposals.hq.nasa.gov/**.

User identifications (IDs) and passwords are required by NASA security policies in order to access the SYS-EYFUS Web site.

If the proposer obtained a User ID and password in the process of submitting a proposal for a previous research opportunity announcement, the same user UserID and password can be used to complete the electronic Notice of Intent to Propose in response to this research opportunity announcement.

If you do not have a SYS-EYFUS UserID or password, you may obtain one electronically by going to **http://proposals.hq.nasa.gov** and performing the following steps:

e) Click the hyperlink for new user that will take you to the Personal Information Search Page.
f) Enter your first and last name. SYS-EYFUS will **search** for your record information in the SYS-EYFUS database.
g) Confirm your personal information by **choosing** the record displayed.
h) Select **continue**, and a User ID and password will be e-mailed to you.

Once you receive your User ID and Password, **login** to the SYS-EYFUS Web site and follow the instructions for **New Notice of Intent.**

At a minimum, the following information will be requested:

- NRA number, alpha-numeric identifier, (Note: this may be included on the Web site template);
- the Principal Investigator's name, mailing address, phone number, and E-mail address;
- the name(s) of any Co-Investigator(s) and institution(s) known by the NOI due date;
- a descriptive title of the intended investigation; and,
- a brief description of the investigation to be proposed.

A separate NOI must be submitted for each intended proposal.

Appendix D
Proposal Cover Page

Proposal Number: _____

Date: __/___/_____

Name of Submitting Institution: **Congressional District:**

Proposal Title:	
Name of Submitting Institution:	**Congressional Distinct:**

Certification of Compliance with Applicable Executive Orders and US Code

By submitting the proposal identified in this *Cover Sheet/Proposal Summary* in response to this Research Announcement, the Authorizing Official of the proposing institution (or the individual proposer if there is no proposing institution) as identified below:

- certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
- agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- confirms compliance with all provisions, rules, and stipulations set forth in the two Certifications contained in this NRA [namely, (i) *Assurance of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs, and (ii) Certifications, Disclosures, And Assurances Regarding Lobbying and Debarment & Suspension*].

Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

NASA PROCEDURE FOR HANDLING PROPOSALS

This proposal shall be used and disclosed for evaluation purposes only, and a copy of this Government notice shall be applied to any reproduction or abstract thereof. Any authorized restrictive notices that the submitter places on this proposal shall also be strictly complied with. Disclosure of this proposal for any reason outside the Government evaluation purposes shall be made only to the extent authorized by the Government.

Principal Investigator Na		**Authorized Institutional Official Name:**	
Organiz on:		**Organization:**	
Depar ent:		**Department:**	
Mailing Ad ss:		**ling A d**	
City, State Zip:		**y, S Zip:**	
Telephone N ber:		**Tele one N mber:**	
Fax Nu ber:		**ax N mber:**	
Email Ad s:		**ail A ress:**	
Principal Investigator Signature:	_____	**Authorized Inst tional Official Si ature:**	_____
Date:	_____	**Date:**	_____

Co-Investigator:

Name	Telephone	Email	Institution	Address

Assurance of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The *(Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant ")* hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1972 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognizes and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear on the Proposal Cover Sheet above are authorized to sign on behalf of the Applicant.

CERTIFICATIONS, DISCLOSURES, AND ASSURANCES
REGARDING LOBBYING AND DEBARMENT & SUSPENSION

1. LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 14 CFR Part 1271, as defined at 14 CFR Subparts 1271.110 and 1260.117, with each submission that initiates agency consideration of such applicant for award of a Federal contract, grant, or cooperative agreement exceeding $ 100,000, the applicant must **certify** that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit a Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

2. GOVERNMENTWIDE DEBARMENT AND SUSPENSION

As required by Executive Order 12549, and implemented at 14 CFR 1260.510, for prospective participants in primary covered transactions, as defined at 14 CFR Subparts 1265.510 and 1260.117—

(1) The prospective primary participant **certifies** to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (l)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

APPENDIX E
BUDGET SUMMARY

For period from _____ to _____

• Provide a complete Budget Summary for year one and separate estimated summaries for each subsequent year.
• Enter the proposed estimated costs in Column A (Columns B & C for NASA use only).
• Provide as attachments detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost. See *Instructions For Budget Summary* on following page for details.

		NASA USE ONLY	
	A	**B**	**C**
1. Direct Labor (salaries, wages, and fringe benefits)	_____	_____	_____
2. Other Direct Costs:			
a. Subcontracts	_____	_____	_____
b. Consultants	_____	_____	_____
c. Equipment	_____	_____	_____
d. Supplies	_____	_____	_____
e. Travel	_____	_____	_____
f. Other	_____	_____	_____
3. Indirect Costs*	_____	_____	_____
4. Other Applicable Costs	_____	_____	_____
5. SUBTOTAL--Estimated Costs	_____	_____	_____
6. Less Proposed Cost Sharing (if any)	_____	_____	_____
7. Carryover Funds (if any)			
a. Anticipated amount : _____			
b. Amount used to reduce budget	_____	_____	_____
8. Total Estimated Costs	_____	_____	XXXXXXX
9. APPROVED BUDGET	XXXXXX	XXXXXXX	_____

***Facilities and Administrative Costs.**

INSTRUCTIONS FOR BUDGET SUMMARY

1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.

2. Other Direct Costs:
    a. Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting.
    b. Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay (not to exceed the equivalent of the daily rate for Level IV of the Executive Schedule, exclusive of expenses and indirect costs).
    c. Equipment: List separately. Explain the need for items costing more than $5,000. Describe basis for estimated cost. General-purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Grant Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
    d. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
    e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination and number of travelers where known.
    f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate.

3. Indirect Costs*****: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.

4. Other Applicable Costs: Enter total explaining the need for each item.

5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.

6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.

7. Carryover Funds (if any): Enter the dollar amount of any funds expected to be available for carryover from the prior budget period. Identify how the funds will be used if they are not used to reduce the budget. NASA officials will decide whether to use all or part of the anticipated carryover to reduce the budget (not applicable to 2nd-year and subsequent-year budgets submitted for award of a multiple year award).

8. Total Estimated Costs: Enter the total after subtracting items 6 and 7b from item 5.

* Facilities and Administrative (F&A) Costs